

ANNUAL REPORT

OF

THE CURATOR

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

AT HARVARD COLLEGE,

TO THE

PRESIDENT AND FELLOWS OF HARVARD COLLEGE

FOR

1904-1905.

CAMBRIDGE, U.S.A.:

UNIVERSITY PRESS: JOHN WILSON AND SON

1905.

REPORTS ON THE SCIENTIFIC RESULTS OF THE EXPEDITION TO THE EAST-ERN TROPICAL PACIFIC, IN CHARGE OF ALEXANDER AGASSIZ, BY THE U. S. FISH COMMISSION STEAMER "ALBATROSS," FROM OCTOBER, 1904, TO MARCH, 1905, LIEUTENANT COMMANDER L. M. GARRETT, U. S. N., COMMANDING, PUBLISHED OR IN PREPARATION:—

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|--|---|
| A. AGASSIZ. General Report on the Expedition. | P. KRÜMBACH. The Sagittae. |
| A. AGASSIZ. I. ¹ Three Letters to Geo. M. Bowers, U. S. Fish Com. | R. VON LENDENFELD. The Sponges. |
| A. AGASSIZ and H. L. CLARK. The Echini. | H. LUDWIG. The Holothurians. |
| F. E. BEDDARD. The Earthworms. | H. LUDWIG. The Starfishes. |
| H. B. BIGELOW. The Medusae. | H. LUDWIG. The Ophiurans. |
| R. P. BIGELOW. The Stomatopods. | J. P. McMURRICH. The Actinaria. |
| S. F. CLARKE. The Hydroids. | G. W. MÜLLER. The Ostracods. |
| W. R. COE. The Nemerteans. | JOHN MURRAY. The Bottom Specimens. |
| L. J. COLE. The Pycnogónida. | MARY J. RATHBUN. The Crustacea. |
| W. H. DALL. The Mollusks. | HARRIET RICHARDSON. II. ² The Isopods. |
| C. R. EASTMAN. The Sharks' Teeth. | W. E. RITTER. The Tunicates. |
| B. W. EVERMANN. The Fishes. | ALICE ROBERTSON. The Bryozoa. |
| W. G. FARLOW. The Algae. | B. L. ROBINSON. The Plants. |
| S. GARMAN. The Reptiles. | G. O. SARS. The Copepods. |
| H. J. HANSEN. The Cirripeds. | H. R. SIMROTH. The Pteropods and Heteropods. |
| H. J. HANSEN. The Schizopods. | TH. STUDER. The Alcyonaria. |
| S. HENSHAW. The Insects. | T. W. VAUGHAN. The Corals. |
| W. E. HOYLE. The Cephalopods. | R. WOLTERECK. The Amphipods. |
| C. A. KOFOID. III. ³ The Protozoa. | W. McM. WOODWORTH. The Annelids. |

¹ Bull. M. C. Z., Vol. XLVI., No. 4, April, 1905, 22 pp.

² Bull. M. C. Z., Vol. XLVI., No. 6, July, 1905, 4 pp., 1 pl.

³ Bull. M. C. Z., Vol. XLVI., No. 9, September, 1905, 5 pp., 1 pl.

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CAMBRIDGE, MASS

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WILLIAM E. CASTLE *Assistant Professor of Zoölogy.*

THOMAS A. JAGGAR, JR. *Assistant Professor of Geology.*

Instructors and Assistants in the Laboratories of Zoölogy and Geology.

HERBERT W. RAND *Instructor in Zoölogy.*

PHILIP S. SMITH *Instructor in Geology.*

LEON J. COLE *Austin Teaching Fellow in Zoölogy.*

I. A. FIELD *Austin Teaching Fellow in Zoölogy.*

H. E. WALTER *Assistant in Zoölogy.*

G. R. MANSFIELD *Austin Teaching Fellow in Geology*

H. N. EATON *Assistant in Geology.*

J. W. EGGLESTON *Assistant in Geology.*

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W. M. BARROWS *Assistant in Palaeontology.*

E. J. SAUNDERS *Assistant in Meteorology and Physiography.*

REPORT.

TO THE PRESIDENT AND FELLOWS OF HARVARD COLLEGE:—

Throughout the Academic year, 1904–1905, eleven courses in Zoölogy were given, by Professors Mark, Jackson, Parker, Castle, and Dr. Rand, to students in Harvard University, and four courses to students of Radcliffe College. The assistants in the University courses were Messrs. M. W. Blackman, L. J. Cole, Manton Cope-land, N. C. Davis, I. A. Field, A. D. Howard, and H. E. Walter; in those given for Radcliffe College, Mr. A. S. Pearse and Miss Edith N. Buckingham. During the summer, seven students carried on work at the Laboratory of the U. S. Fisheries Bureau at Woods Hole, and twelve persons, six connected with Harvard University, availed themselves of the facilities offered by the Bermuda Biological Station for Research. The incomes of the Humboldt Fund and the Virginia Barret Gibbs Fund have been applied, as in late years, for the benefit of students connected with the Zoölogical Laboratory.

In the Department of Geology and Geography, Professor Davis, as Sturgis-Hooper Professor of Geology, conducted two courses, one of research elected by two students, and a second, open to graduates and undergraduates, given to fifteen students. Mr. Isaiah Bowman was assistant in the second course. The geological courses, other than those of Professor Davis, were given by Professors Shaler, Jackson, Ward, Woodworth, Jaggar, and Dr. Smith, assisted by Messrs. A. H. Gale, Augustus Locke, G. R. Mansfield, H. E. Simpson, and S. A. Starratt. These courses, nineteen in number, were attended by 460 students of Harvard University; the four courses in Radcliffe College were taken by 40 students. In the Summer School, Professor Shaler and Dr. Smith of the Geological Department, and Prof. J. E. Woodman of Dalhousie College, Halifax, gave two courses to eighteen students. Prof. J. B. Woodworth's course in advanced field work in the Rocky Mountains of Montana was taken by three students.

The Museum is indebted to Messrs. Bangs, Brewster, Faxon, and Woodworth for the care they have taken of the collections under their charge. The accompanying special reports give the details as to the additions received and the work accomplished during the year.

Of the collections received, mention should be made of the valuable series of Vertebrates from Gorgona Island, Colombia, the Pearl Islands, Bay of Panama, and from the vicinity of the city of Panama, presented by Mr. John E. Thayer, and of the collections, chiefly entomological, presented by Mr. A. A. Packard. Mr. Packard's father, the late Professor A. S. Packard, a graduate of the Lawrence Scientific School, and a student of, and assistant to, the founder of this Museum, was connected for many years (1867-1878) with the Peabody Academy of Science of Salem, and later, from 1878 until his death in February, 1905, with Brown University. Professor Packard bequeathed to the Museum a complete set of his scientific publications, other than books, and left the disposition of his collections to his son. Throughout his life, Professor Packard was an ardent accumulator of material and a prolific author. His collections, with many types, gathered during his residence in Salem, have been the property of the Museum since 1885, and Mr. Packard, recognizing the advantages to his father's fame and to future investigators, has given the Museum the collections amassed by his father since 1878. We are also indebted to Messrs. Allen, Barbour, and Bryant for the larger part of the specimens collected during their explorations of the Bahamas; to Mr. Addison Gulick for a series of Bermudian land shells, fossil and recent, and to Professor W. W. Coe for a number of Nemerteans from the west and northwest coasts of America.

The specimens selected for the Exhibition room devoted to the Palaeozoic faunae, have been arranged, and the room has been opened to the public during the past year. The three cases on the south wall of the room are filled with Vertebrates; the other wall cases and those of the central floor space, equal in all to twenty-seven cases, are given over to the Invertebrates. The richness of the Museum collections in Palaeozoic fossils will make this room, when the material is completely mounted and labelled, fairly representative of the older faunae and of much general interest. The casing of the Exhibition room for the Mesozoic faunal collections has been completed, and a beginning made in

the selection of representative species. The floor case shows the cast of *Iguanodon bernissartensis*, from the Wealden of Belgium, as the central feature, with casts and portions of the skeletons of Dinosaurs and of Vertebrates, other than Fishes, around it. The Fishes and a few other Vertebrates occupy the wall cases on the north side of the room, while the Invertebrates will be displayed in the cases on the south side, and the large table cases on the east and west sides. Considerable wall space, outside of the cases, is used for many of the more bulky Vertebrates. To the African faunal room there has been added, by purchase from Rowland Ward, a fine male of the South African Ostrich, *Struthio australis*, and a magnificent male Hippopotamus from the Mosello River, Zambesi; the latter, an excellent example of modern taxidermy, is nearly maximum size for the species, and with the Giraffe received in 1903, makes an effective exhibition of two characteristic African Mammals. The principal other additions to the exhibition collections consist of the Reptiles mounted by the Museum preparator, Mr. George Nelson; of these, twenty-eight have been added, the more notable being a group of the Mexican Heloderma, *H. horridum*; one of the Bahama Iguana, *Cyclura baeolopha*, and a fine Boa, *B. constrictor*. For the Boa and the Iguanas we are indebted to the interest of Mr. Thomas Barbour; the Helodermas were obtained in exchange from the American Museum of Natural History.

The U. S. Fish Commission Steamer "Albatross," under the command of Lieut. Commander L. M. Garrett, U. S. N., was placed at the disposal of Mr. Agassiz, and was occupied with deep-sea work in the Eastern Tropical Pacific from October, 1904, until March, 1905. Mr. Agassiz was accompanied by Prof. C. A. Kofoed of the University of California, Mr. H. B. Bigelow, and Mr. Magnus Westergren of the Museum. The cruise extended from San Francisco to Panama, from Panama to the Galapagos, and thence to Aguja Point. From Aguja Point, the "Albatross" worked towards the western edge of the Chili-Peruvian Current, then east through the Milne Edwards Deep to Callao. Leaving Callao on December 3d, Easter Island was reached on the 15th. Considerable shore work was done at Easter Island, and on January 3, 1905, the "Albatross" arrived at Wreck Bay, Chatham Island, Galapagos. From Wreck Bay, the cruise continued to Manga Reva, and from that place to Acapulco, which was reached February 24th. Mr. Agassiz's letters, written during the voyage, have been published

in the Bulletin, Vol. 46, No. 4. They give a preliminary report of the cruise; a more extended account, with charts and illustrations, will be published in an early issue of the Memoirs. The collections arrived safely and have been distributed to thirty-four specialists. The reports on the scientific results will appear chiefly in the Bulletins and Memoirs of the Museum.

The library of the Museum consists of 41,157 volumes and 35,033 pamphlets; the accessions for the year are 1,982 volumes and 1,607 pamphlets.

The publications for the year include two volumes and one number of the Memoirs, one volume and nine numbers of the Bulletin, and the Annual Report. The two volumes of the Memoirs (Volumes 30 and 31) contain the Reports on the collection of Panamic deep-sea Echini by Mr. Agassiz, and the Starfishes by Professor Ludwig, made by the "Albatross" expedition of 1891. Together, these volumes make one of the most extensive publications that the Museum has yet issued. Mr. Springer's Memoir on *Cleiocrinus* describes and figures, in detail, one of the earliest of known Crinoids, and one of most intricate structure. Of the nine numbers of the Bulletin, four numbers contain reports on the scientific results of the expeditions of the "Albatross," two on the one of 1891, and two on the recent cruise in the Eastern Tropical Pacific; one number is a report upon some of the results of Mr. Agassiz's expedition to the Maldives; one is a contribution from the Zoölogical Laboratory, and one a contribution from the Geological Laboratory; one number deals with Museum collections, and one volume and one number are based primarily on Museum collections. The Corporation has granted an appropriation of \$350.00, to assist in the publication of Contributions from the Zoölogical and Geological Laboratories, and Mr. Agassiz's generous interest provides for the publication of the Memoirs and Bulletins which contain the reports on the scientific results of the expeditions connected with his work.

The appointment of Professor Hubert Lyman Clark, as assistant in Invertebrate Zoölogy, supplies a long-felt want; there is, however, urgent need for assistants in Invertebrate Palaeontology, in Entomology, and in Ornithology.

SAMUEL HENSHAW.

REPORT ON THE ZOÖLOGICAL LABORATORY.

BY E. L. MARK.

IN accordance with the custom of previous reports the number of students in the several courses in Zoölogy during the academic year 1904-05 and their distribution by classes is given in tabular form, the numbers printed in *italics* referring to students of the Lawrence Scientific School.

| * Courses 1904-05. | Grad. | Sen. | Jun. | Soph. | Fresh. | Spec. | Bussey. | Total. |
|-----------------------|-------|-------|-------|-------|--------|-------|---------|------------|
| Zoölogy 1 | 4 | 32+7 | 22+4 | 40+3 | 45+5 | 8+13 | 1 | 152+32=184 |
| " 2 | 4 | 3 | 7+1 | 14+6 | 1 | 4 | 1 | 30+11=41 |
| " 3 | 4 | 4+1 | 4+4 | 3+1 | | | | 15+6=21 |
| " 4 | 4 | 1+1 | 4+1 | 1 | | 1 | | 10+3=13 |
| " 5 | 2 | 1+1 | 4+1 | 1 | | 1 | | 8+3=11 |
| " 8 | 1 | | 1 | | | | | 2=2 |
| " 9 | 3 | 1 | 1+1 | | | 1 | | 5+2=7 |
| " 10 | 9 | 2 | | | | | | 9+2=11 |
| " 13 | 5 | 1+1 | 1 | 1 | | | | 7+2=9 |
| " 15 | 8 | | 1 | 1 | | 1 | | 8+3=11 |
| " 20 | 11 | 1+2 | | | | 1 | | 12+3=15 |
| Sums | 55 | 44+15 | 44+13 | 59+12 | 46+5 | 8+22 | 2 | 258+67=325 |

Similarly the following table shows the number of students of Radcliffe College who took courses in Zoölogy:—

| Courses. 1904-05. | Gr. | Sen. | Jun. | Soph. | Fresh. | Spec. | Total. |
|----------------------|-----|------|------|-------|--------|-------|--------|
| Zoölogy 1 | 1 | 11 | 4 | 2 | 3 | 3 | 24 |
| " 2 | | | | 1 | | 2 | 3 |
| " 3 | | 1 | | 1 | | 1 | 3 |
| " 20 | 3 | 1 | | | | | 4 |
| Sums | 4 | 13 | 4 | 4 | 3 | 6 | 34 |

Dr. Alexander Petrunkévitch, who was approved as Docent in Zoology to lecture on Cytology in the second half-year, was com-

pelled by serious family sickness to leave Cambridge in the middle of the year, and was therefore unable to give the course. Otherwise the instruction given did not differ from that of the preceding year, except in so far as concerned alternating courses.

Diagrams and demonstration material used principally in Courses 1 and 2, which had hitherto been arranged in cases on the fourth floor, were transferred to the first-floor lecture-room and renumbered to correspond with their places in new cases. This resulted in saving time both to the instructors and the janitor.

After the announcement of courses in Zoölogy for 1904-05 had been issued (in July 1904) an arrangement was made which allowed the Department to retain the services of Dr. H. W. Rand. The serious curtailment of the work in Zoölogy which had been impending — necessitating the withdrawal of Course 13 and the reduction of Zoölogy 3 to a half-course, to be given by Professor Parker — was thus averted, and it was possible to restore the courses to the same form which they had had in previous years.

The lectures in Zoölogy 1 were given by Professor Parker, who, as usual, gave systematic attention to supervising the laboratory work and to the training of the assistants who aided him in this important part of the course. The chief assistant in the course in Harvard University was Mr. Leon J. Cole, Austin Teaching Fellow; the sub-assistants were Messrs. H. E. Walter, M. Cope-land, and N. C. Davis. In Radcliffe College the chief assistant was Mr. A. S. Pearse, the sub-assistant, Miss Edith N. Buckingham. Owing to the loss in previous years of a certain amount of microscopic apparatus, it was decided to institute an inspection of this apparatus at the close of each laboratory period. This resulted in entirely preventing such loss.

In Zoölogy 2, by Professor Castle, the lectures were increased to forty, and a certain amount of time each week was devoted to oral reviews of topics discussed in previous lectures. More time than heretofore was also given by the instructor to personal supervision of the laboratory exercises, thus enabling him to become better acquainted with the work of individual students. Mr. A. D. Howard, Austin Teaching Fellow, was chief assistant in the course, and Mr. M. W. Blackman was sub-assistant.

Zoölogy 3, possibly owing to the announced change in its nature and the subsequent restoration of it to its former scope, was not so largely elected as in the preceding year. One gradu-

ate took the work for the first half-year without being enrolled ; on the other hand three of those enrolled were dropped before the end of the year. The plan of devoting occasionally a lecture hour to a conference on previous work, instead of a formal lecture, resulted in giving to some of the poorer students an increased interest in the work, and is thought by the instructor, Dr. Rand, to be worthy of further trial. A new edition of the Outline of the Laboratory Work in this course was prepared by Dr. Rand and published by the Harvard Coöperative Society. This outline on the Comparative Anatomy of Vertebrates, originally prepared by Professor Parker, has been revised and considerably amplified by Dr. Rand in the new edition. The assistant in this course was Mr. I. A. Field.

Zoölogy 4 and 5 were given substantially as in the preceding year, Dr. Rand having charge of the laboratory work and giving in Course 4 a few of the lectures on the anatomy and histology of the Hirudinea.

Zoölogy 8 and 9 were given by Professor Jackson. Several specimens useful for students in Palaeozoölogy were purchased from Ward's Natural Science Establishment, and others were received from students in the Department.

Six of the eleven students enrolled in Zoölogy 10, under Professor Castle, were allowed to take the lectures without laboratory work, and to count this as a half-course. The remaining five were occupied with the investigation of special problems, mainly questions of inheritance, and the results of their studies will be presented later for publication. Two of the five met the laboratory requirements of this course by giving additional time to the work selected for investigation in Zoölogy 20. Contribution 164 was based on work done in part in connection with this course in a previous year.

In Zoölogy 13, by Professor Parker, both lectures and laboratory exercises were substantially the same as in 1903-04 ; but in Zoölogy 16 the lectures were thoroughly revised. The laboratory work in Course 16 consisted, as heretofore, of separate research topics. In four cases these were identical with the topics of the same students in Zoölogy 20. In some of the other seven cases the results reached are to be presented for publication. Contributions from the Zoölogical Laboratory numbered 161 and 162 represent work done in this course or its companion course (Zoölogy 15), and 163 is based on experiments conducted under the

supervision of Professor Parker at the Laboratory of the U. S. Fisheries Bureau at Woods Hole.

Fifteen students pursued research problems in Zoölogy 20, three under the direction of Professor Castle, four under Professor Parker, seven under Professor Mark, and one under Professors Parker and Mark jointly. As already stated, in the case of six of the students working under the direction of Professors Parker and Castle, the laboratory requirements of the more formal courses were met by devoting the laboratory time to the research work of Zoölogy 20. Mr. M. W. Blackman completed two papers, one of which he presented as a thesis for the Doctor's degree, the other being on The Spermatogenesis of the Myriapods. IV. On the Karyosphere and Nucleolus in the Spermatocytes of *Scolopendra subspinipes*.

The work of several students is nearly ready for publication and that of others is well advanced.

The degree of Doctor of Philosophy was conferred in June, 1905, on Mr. Maulsby Willett Blackman, whose thesis was entitled The Spermatogenesis of the Myriapods. III. The Spermatogenesis of *Scolopendra heros*.

Besides giving critical supervision to all the papers appearing as Contributions from the Zoölogical Laboratory and from the Bermuda Biological Station for Research, Professor Mark has published an address prepared for Section F. (Zoölogy) of the American Association for the Advancement of Science, the title of which appears in the list of Contributions from the Bermuda Station.

Professor Jackson has published the following articles: (1) Charles Emerson Beecher. Amer. Nat., Vol. 38, pp. 407-426, portrait. June [Aug.] 1904. (2) The Protection of Native Plants. Trans. Mass. Hortic. Soc. for 1904, pp. 111-119. 1904. (3) Notes in the Cultivation of Peonies. *Ibid.*, pp. 141-157, figs 1-4. 1904. (4) John Richardson: his House and Garden. *Ibid.*, pp. 159-202, pls. 1-14, figs. 5-10. 1904. (5) Professor Packard's "Lamarck, his Life and Works." Psyche, Vol. 12, pp. 36-38. April, 1905.

Professor Parker has published the following papers: Maldive Cephalochordates. Bull. Mus. Comp. Zoöl., Vol. 46, No. 2, pp. 39-52, 2 pls. 1904. The Function of the Lateral-Line Organs in Fishes. Bull. U. S. Bureau Fisheries, Vol. 24, pp. 183-207. 1905. No. 157 of the Contributions from this Laboratory; in collaboration with S. A. Starratt, No. 155 of the same Contributions,

and, in collaboration with Miss Adele M. Fielde, *The Reactions of Ants to Material Vibrations*. *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 56, pp. 642-650. 1905.

Professor Castle has continued his studies on inheritance in guinea-pigs and rabbits. He has published, in addition to No. 158 of the Contributions from this Laboratory, an address, given before the American Society of Naturalists at its meeting in Philadelphia, on *The Mutation Theory of Organic Evolution, from the Standpoint of Animal Breeding*. *Science*, Vol. 21, pp. 521-525. April 7, 1905.

Dr. Rand has published three papers in the Contributions from this Laboratory, Nos. 156, 165, and 166, the second in conjunction with Mr. J. L. Ulrich. He also supervised the work the results of which are embodied in Contribution No. 167.

Dr. Petrunkévitch has published, as No. 160 of the Contributions from this Laboratory, a paper on Natural and Artificial Parthenogenesis, presented before Section F (Zoölogy) of the American Association for the Advancement of Science at its meeting in Philadelphia. It is a matter of deep regret to the Department that Dr. Petrunkévitch is compelled to remove from Cambridge and give up his connection with the Laboratory.

The Virginia Barret Gibbs Scholarship was reassigned for 1904-05 to Mr. John H. McClellan.

Of the five persons carrying on work at Woods Hole during the summer of 1904, two received aid from the Humboldt Fund to the amount of \$22.85, and of the six working at the Bermuda Station one received from the same source \$70.00.

During the summer of 1905 seven students carried on work at the United States Fisheries Bureau in Woods Hole, three of them being employed as assistants in the work of the Bureau.

Five students received aid in the summer of 1905 from the Humboldt Fund, amounting to \$132.85, four while working at Woods Hole, and one at Cambridge.

Professors Castle and Mark have received renewals of grants from the Trustees of the Carnegie Institution of Washington to aid in the study of questions in heredity.

The meetings of the Zoölogical Club were held on the afternoons of Mondays throughout the year, and the topics under discussion were announced in the Calendar. There were twenty-five meetings, and fifty-five papers were presented; thirty-two of them were summaries of original work.

Three numbers of the Contributions from the Bermuda Biological Station for Research have been published since those recorded in the report for 1903-04:—

- No. 4. COE, W. R. — The Anatomy and Development of the Terrestrial Nemertean (*Geonemertes agricola*) of Bermuda. Proc. Bost. Soc. Nat. Hist., Vol. 31, No. 10, pp. 531-570, pls. 23-25. November, 1904.
- No. 5. BIGELOW, H. B. — The Shoal-Water Deposits of the Bermuda Banks. Proc. Amer. Acad. Arts and Sci., Vol. 40, No. 15, pp. 557-592, 4 maps. February, 1905.
- No. 6. MARK, E. L. — The Bermuda Islands and the Bermuda Biological Station for Research. Proc. Amer. Assoc. Adv. Sci., Fifty-fourth Meeting. Separates, 32 pp., 16 pls. February, 1905.

Professor Parker was appointed Acting Director of the Bermuda Biological Station for Research for the summer of 1905. Besides Mr. John F. Cole, who carried on for the Station magnetic observations during the months of March and April, there were twelve biologists enrolled. Of these, seven were University instructors, three in Harvard and one each in the University of Pennsylvania, the University of Cincinnati, Washington [State] University and Syracuse University.

The conditions which necessitated retrenchment during the year 1903-04 still continue, and weigh heavily on the Department.

It is proposed to amplify somewhat in the future the instruction in some of the courses by presenting in alternate years different portions of the fields now more or less completely covered each year. For the coming year Professor Mark's lectures on Embryology of Vertebrates will be devoted to Organogeny (Zoölogy 6), leaving the Early Stages of Development (Zoölogy 5) for 1906-07. In like manner Professor Parker's lectures on Comparative Histology will deal with Epithelial and Nervous Tissues in 1905-06, and with Muscular and Sustentative Tissues the following year. Professor Castle proposes to divide each of his alternating courses (Zoölogy 10 and 11) into half-courses (10*a*, 10*b*, and 11*a*, 11*b*), which may be taken separately, and to change somewhat the ground covered. Course 11*a*, to be given in the first half of the coming year, will be devoted to Variation, Heredity, and the Principles of Animal Breeding. Course 11*b*, in the second half-year, will deal with the Natural History of

Domesticated Animals. The half-courses alternating with these are to be: (10*a*) Influences of the Environment on Animal Form, and (10*b*) The Nature and Causes of Sex.

*Contributions from the Zoölogical Laboratory from
July 1, 1904, to June 30, 1905.*

152. ALLEN, G. M. — The Heredity of Coat Color in Mice. Proc. Amer. Acad. Arts and Sci., Vol. 40, No. 2, pp. 59–163. July, 1904.
153. SARGENT, P. E. — The Optic Reflex Apparatus of Vertebrates for Short-circuit Transmission of Motor Reflexes through Reissner's Fibre; its Morphology, Ontogeny, Phylogeny, and Function. — Part I. The Fish-like Vertebrates. Bull. Mus. Comp. Zoöl., Vol. 45, No. 3, pp. 127–258, 11 pls. July, 1904.
154. MAST, S. O. — A Simple Apparatus for Aërating Liquid Solutions. Amer. Nat., Vol. 38, No. 453, pp. 655–660. September [October], 1904.
155. PARKER, G. H., and STARRATT, S. A. — The Effect of Heat on the Color Changes in the Skin of *Anolis carolinensis* Cuv. Proc. Amer. Acad. Arts and Sci., Vol. 40, No. 10, pp. 455–466. November, 1904.
156. RAND, H. W. — The Behavior of the Epidermis of the Earthworm in Regeneration. Arch. f. Entwicklungsmechanik, Bd. 19, No. 1, pp. 16–57, Taf. 1–3. February, 1905.
157. SMALLWOOD, W. M. — The Maturation, Fertilization, and Early Cleavage of *Haminea solitaria* (Say). Bull. Mus. Comp. Zoöl., Vol. 45, No. 4, pp. 259–318, 13 pls. December, 1904.
158. CASTLE, W. E. — Heredity of Coat Characters in Guinea-Pigs and Rabbits. Publ. Carnegie Inst. Washington, No. 23. 78 pp., 6 pls. February, 1905.
159. PARKER, G. H. — The Reversal of Ciliary Movement in Metazoans. Amer. Journ. Physiol., Vol. 13, No. 1, pp. 1–16. February, 1905.
160. PETRUNKÉVITCH, A. — Natural and Artificial Parthenogenesis. Amer. Nat., Vol. 39, No. 458, pp. 65–76. February [March], 1905.
161. SMITH, G. — The Effect of Pigment-Migration on the Phototropism of *Gammarus annulatus* S. I. Smith. Amer. Journ. Physiol., Vol. 13, No. 3, pp. 205–216. April, 1905.
162. CARPENTER, F. W. — The Reactions of the Pomace Fly (*Drosophila ampelophila* Loew) to Light, Gravity, and Mechanical

- Stimulation. Amer. Nat., Vol. 39, No. 459, pp. 157-171. April, 1905.
163. PETERS, A. W. — Phosphorescence in Ctenophores. Journ. Exp. Zoöl., Vol. 2, No. 1, pp. 103-116. April, 1905.
164. HAHN, C. W. — Dimorphism and Regeneration in Metridium. Journ. Exp. Zoöl., Vol. 2, No. 2, pp. 225-235. May, 1905.
165. RAND, H. W., and ULRICH, J. L. — Posterior Connections of the Lateral Vein of the Skate. Amer. Nat., Vol. 39, No. 462, pp. 349-364. June, 1905.
166. RAND, H. W. — The Skate as a Subject for Classes in Comparative Anatomy; Injection Methods. Amer. Nat., Vol. 39, No. 462, pp. 365-379. June, 1905.
167. ROMEISER, T. H. — A Case of Abnormal Venous System in *Necturus maculatus*. Amer. Nat., Vol. 39, No. 462, pp. 391-396. June, 1905.

REPORT OF THE STURGIS-HOOPER PROFESSOR OF GEOLOGY.

BY WILLIAM M. DAVIS.

THE usual courses of instruction have been given during the past year. The course on the Physiography of the United States, open to undergraduates and graduates in the second half of the year, has been improved with the aid of Mr. I. Bowman, assistant, by the development of a systematic series of laboratory exercises, based chiefly on the topographical maps of the United States Geological Survey. The advanced course, primarily for graduates and extending through the year, has been conducted as heretofore, each student selecting a special problem and reporting upon his work at regular meetings of the class.

During the autumn a share of my time was given to the publication of a report on the journey to Turkestan that was undertaken two years ago under the direction of Mr. Raphael Pumpelly as leader of a Carnegie Institution expedition. A meeting for organization of the American Association of American Geographers, in preparation for which there was much correspondence, was held in Philadelphia Christmas week; this association appears to be the only geographical society in the world in which membership is limited to persons of some degree of expert knowledge and performance. During the period of the mid-year examinations, a short course of lectures on physiography was given at the Johns Hopkins University in Baltimore. An inter-collegiate excursion was organized to visit the glacio-marginal channels in the uplands near Syracuse, N. Y., during the April recess.

Special attention has been given during the year to three problems, concerning which essays have been or will soon be published: the bearing of physiography on Suess's theories, in which certain observations made in the Tian Shan Mountains in 1903 were discussed; the problem of fault-block mountains, based on a continuation of the work of earlier years and referring

particularly to the results of an excursion to certain ranges in the deserts of Utah in 1904; and the peculiar features of the geographical cycle in an arid climate, with special regard to the work of Passarge on the Kalahari Desert.

A week was given early in July to the guidance of a party of students and professors forming an intercollegiate summer geological course through the valleys of the Susquehanna and the Juniata in central Pennsylvania. On July 15 I sailed from New York to join the official party of the British Association on its excursion to South Africa, as a result of which my return to Cambridge will be delayed somewhat beyond the beginning of the next academic year.

Publications.

The Relations of the Earth Sciences in View of their Progress in the Nineteenth Century. Journ. Geol., Vol. 12, pp. 669-687. 1904.
Glacial Erosion in the Sawatch Range, Colorado. Appalachia, Vol. 10, pp. 392-404. 1904.

A Journey across Turkestan. Carnegie Institution, Washington, Publication No. 26, pp. 21-119. 1905.

The Opportunity for the Association of American Geographers. Bull. Amer. Geogr. Soc., 37, pp. 84-86. 1905.

The Bearing of Physiography on Suess's Theories. Amer. Journ. Sci., Vol. 19, pp. 265-273. 1905.

Tides in the Bay of Fundy. Nat. Geogr. Mag., Vol. 16, pp. 71-76. 1905.

Leveling without Baseleveling. Science, Vol. 21, pp. 825-828. 1905.

By recent students:—

D. W. JOHNSON. The Tertiary History of the Tennessee River. Journ. Geol., Vol. 13, pp. 194-231. 1905.

W. S. TOWER. The Development of Cut-off Meanders. Bull. Amer. Geogr. Soc., Vol. 36, pp. 589-599. 1904.

REPORT OF THE DEPARTMENT OF GEOLOGY AND
GEOGRAPHY.

BY JAY B. WOODWORTH.

THE following report upon the work done by the staff of the geological section of The University Museum for the year of 1904-05, does not include the courses given by the Sturgis-Hooper Professor of Geology.

The accompanying table shows the number of students who completed courses of instruction in the laboratories of the Department. Column 1 gives the number of those who passed the courses of whom only account is taken in the official returns. The second column shows the total attendance of Radcliffe students in courses corresponding to those in Harvard University.

There have been no changes during the year in the staff of instructors. Dr. P. S. Smith, in addition to his work as Instructor in charge of Geology A acted as assistant in Courses 4 and 5. The other assistants in the Department were Mr. H. E. Simpson in A and B; Mr. S. A. Starratt in 11 and 14; Mr. G. R. Mansfield in 22. Messrs. A. H. Gale, Augustus Locke, and F. H. Sawyer served as student-assistants in 5, and Mr. Isaiah Bowman in 6.

As in former years the Department arranged with the Summer School Committee for an elementary half-course in Dynamical Geology in Cambridge in the summer of 1905 to be conducted by Professors Shaler and J. E. Woodman; also an elementary course

| Courses. | | 1 | 2 |
|----------------|------------------------------|-----|----|
| Geology | A | 91 | |
| " | B | 51 | 6 |
| " | 1 | 9 | |
| " | 2 | 7 | |
| " | 4 | 77 | 23 |
| " | 5 | 98 | 8 |
| " | 6 | 15 | |
| " | 8 | 21 | 3 |
| " | ¹ 11 | 8 | |
| " | 12 | 1 | |
| " | 13 | 3 | |
| " | 14 | 39 | |
| " | ¹ 15 | 0 | |
| " | 19 | 16 | |
| " | 22 | 9 | |
| Mining Geology | 28 | 11 | |
| " | 20 ^a | 2 | |
| " | 20 ^c | 1 | |
| " | ¹ 20 ^d | 1 | |
| Totals | | 460 | 40 |

¹ In Museum Comparative Zoölogy.

in Physical Geograhpy by Dr. P. S. Smith. For a half-course of advanced field work conducted in the months of July and August in the Rocky Mountains of Montana by Professor Woodworth, the expense is met partly by the funds of the Department, by a grant from the Corporation, and by fees collected from the students. This course is also included in the Joint Announcement the plan of which was explained in the report of Professor Ward upon the Department for 1903-04.

The Department gratefully acknowledges the gift of \$100.00 from Sir John Murray for a collection of deep-sea deposits.

In the report of the subcommittee of the Department upon the Geological Museum acknowledgment is made of the use of the balance of the construction fund for cases in the Geological Museum. Dr. G. J. Pfeiffer has deposited, subject to recall at his pleasure, a large globe in the Geological Lecture Room.

During the winter Sir John Murray addressed the Geological Conference upon the subject of the Deep Sea and its Deposits, and Professor Albrecht Penck spoke on Climatic Variations of the Ice Age, Glacial Sculpture of the Alps, and Man and the Ice Age. Mr. W. D. Johnson, of the U. S. Geological Survey, also addressed the Conference on The Erosion of Cirques by Glaciers. A list of other reports made to the Conference whose meetings were held in the Geological Lecture Room is published in the departmental pamphlet for 1905-06.

Professor Shaler continued his lectures on General Geology in Course 4, which by reason of its being restricted to students in the Lawrence Scientific School was given for the first time in the Geological Lecture Room. He also lectured on Palaeontology in Courses 14 and 15. Mr. S. A. Starratt as assistant conducted laboratory work in Geology 14. This work was made the more effective by reason of the transfer of a small series of fossils from the Department of Mineralogy and Petrography. Professor Shaler was engaged during the year on studies of the distribution of the ash deposits in the northern part of the Rocky Mountains of the United States, mainly in Montana.

Professor R. T. Jackson reports that Geology 11 was taken by 11 students; 15 by one student, who, on account of leaving Cambridge early did not complete the work. Geology 20*d* was taken by one student who worked under his direction. Mr. S. A. Starratt assisted Professor Jackson in Course 11.

The teaching collections in Palaeontology are in good condition.

They have been used to some extent by Course 14 in which laboratory work has been introduced as part of the instruction this year. Some material has been purchased from Ward's Natural Science Establishment, and a considerable number of photographic diagrams have been added. Photographic diagrams are extremely desirable for class work, as they are faithful reproductions of original published figures and at the same time are very moderate in cost.

Professor Ward reports that, in accordance with the recommendation of the Committee on Improving Methods of Instruction, the hour of the course in Elementary Meteorology (Geology B) was changed from 11 A.M. to 3.30 P.M., the result being a reduction of more than one-half in the number of students. The advantages of the afternoon hour are so great, however, that the lectures will be given at the same time during the year 1905-06. In Geology 2 (Climatology of the United States), many new laboratory exercises were given, in order that the time spent by the students might be more nearly that which the Committee on Instruction desires to have required in all courses. The result of these changes was a distinct gain in the understanding of the subject-matter of the course. Two theses in Geology 19 (General Climatology) have been accepted for publication.

A most important step towards the improvement of the instruction in Meteorology and Climatology has been taken in providing a proper place for a meteorological observatory. The anonymous gift of \$200.00 has made it possible to erect on the roof of the Geological Section of the University Museum a substantial platform, where all needed instruments may be set up, and instruction in practical instrumental work given. This platform was built in June, 1905, with the permission of Mr. Alexander Agassiz, Director of the University Museum. Some changes have been made in the stairway and in the door leading to the roof in order that access may be safe and easy. A portion of the attic directly beneath the platform will later be adapted as an instrumental work room. Several instruments will be in working order in January, 1906. As opportunity offers additional instruments will be purchased. The advantages of having this small working meteorological observatory for the use of students in Meteorology and Climatology will be very great, and the instruction in these subjects will be materially strengthened.

On May 20, 1905, the Eastern Association of Physics Teachers

held a meeting in the Geographical Laboratory. Professors Davis and Ward gave addresses, and a number of lantern slides and of laboratory and lecture materials used in the courses in Meteorology were exhibited.

Professor J. B. Woodworth gave, as in former years, Courses 5 and 8 and a new half-course in the physical geology of the Carboniferous period. For a number of reasons it seemed desirable to rearrange the first and second years' work in General Geology and to make the fullest use of the large laboratory devoted to Geology on the second floor of the Museum. For several years large numbers of students who do not take the upper courses dealing with Historical Palaeontology have taken Courses 4, 5, and 8, the subject-matter of which is mainly Dynamic Geology, though in Course 8 about one-half of the lectures have in recent years been devoted to the physical features of the great geological rock systems and laboratory exercises involving the study of typical rocks, geological maps, and sections; and the careful study of monographic reports have been gradually introduced to supplement the lectures and field work. The proposal to combine the laboratory and field work with the organized staff of assistants which has in recent years been formed in Course 5 with the lectures of Professor Shaler in Course 4 as a half-course in the first half-year, and to offer as a half-course in elementary Historical Geology in the second half of the year the instruction in that matter heretofore given in Course 8 was approved by the Committee on Instruction and adopted by the Faculty. This plan has the merit of affording the student who has only one year to devote to Geology the opportunity of obtaining an elementary knowledge of the whole field of General Geology in both its dynamic and historical phases. Considerable time has been given this year to bringing together the materials necessary for the laboratory work in this new course. From the materials already in the collections of the laboratory and by the transfer of several sets of rocks from the Frazar collection through the kindness of Professor Wolff, twelve sets of historical specimens have been begun illustrating, as yet in an incomplete way, the principal rock systems from the Archean to the Pleistocene inclusive. A duplicate set is placed at each laboratory table for the simultaneous use of six students. The laboratory is indebted to Professor R. T. Jackson for the transfer of several duplicate fossils, a few typical forms of which from each principal rock system it

is proposed to introduce in the laboratory studies. The field work in this course will include studies of localities of Cambrian and Carboniferous rocks within half a day's journey of Boston, designed to illustrate these periods, and at the same time afford training in methods of field work.

In connection with the field work of Course 8 Professor Woodworth continued his search in Plainville and Attleboro for the interesting foot-prints believed to be mainly Amphibian in the Carboniferous shales of the Narragansett area. Several new forms or varieties have been found and sufficient material is in hand to warrant the publication of a second paper on these tracks. In the April recess a week was spent on Martha's Vineyard in collecting rocks and fossils for the Geological Museum and for the Laboratory. Worthy of a place in the Museum are several examples of sand-blasted pebbles from Katama, and a large variety of rocks from Gay Head, including aetites, fossiliferous Potsdam pebbles, the greensand from the Miocene beds, and Cretaceous sands and clays. Mr. Starratt assisted in the collecting of this material and in obtaining some lignite for Professor Jeffrey of the Botanical Museum.

The Laboratory received from Mr. Philip T. Coolidge, of Watertown, Mass., the valuable gift of a series of rocks and fossils collected by him in eastern New York during the session of the summer school of 1903. The following gifts are also gratefully acknowledged: from Dr. James M. Bell, specimens of the glacial clays and interglacial lignites of northern and northwestern Ontario; from Professor Penck, sand-blasted fragments of limestone from the mouth of the Virgen River, Arizona; from Mr. W. T. Harrison, fragments of fossils from the Middle Cambrian of Braintree, Mass.; from Mr. Albert P. Morse, a collection of sand-blasted wood from the dunes of Ipswich, Mass. This last collection has been reserved for the Geological Museum. The teaching material has also been increased by the making of over a hundred negatives of published illustrations from which enlarged photographic diagrams will be made next year. Professor Woodworth made a collection of rocks and fossils from the Crazy Mountains, the Gallatin Cañon, and Old Baldy Mountain, in Montana, for the Laboratory, in the course of the Western Summer School.

Professor Woodworth continued to devote considerable time to the New York Geological Survey. In September of last year a

reconnaissance was made of the country from Fort Edwards southward, mainly along the west side of the Hudson River to Copake Iron Works, in search of postglacial faults in the bed-rock, and during the winter a paper was prepared embodying the results of this investigation. Much time was also given to the reading of the proof of two reports named in the appended list of publications.

Instruction was given to Radcliffe students in two half-courses and one full course, in which work Dr. Smith assisted in the field.

Professor Jaggar was granted leave of absence from September 1st, 1904, to give instruction in the Massachusetts Institute of Technology and to take charge of the Department of Geology in that institution. He continued to teach two advanced courses of Field Geology in Harvard University, Course 22 in this Department and Mining 28, both of which use the advanced laboratory of the Geological Section of the University Museum. These courses were given together in the first half-year to twenty-one students; in the second half of the year the nine members of Geology 22 worked independently over areas south of Boston. The method pursued was the same as in former years. Certain members of the class made discoveries which will lead to publication. Mr. G. R. Mansfield was associated with Dr. Jaggar in conducting the work, and also prepared a paper on the Quaternary Gravels of the Northern Black Hills. Mr. F. E. Matthes made an extended study of the structure and distribution of eskers south of Weymouth. Mr. I. Bowman co-operated in this work, and also discovered glauconitic clays and found more of the lignite first reported by Upham in the cliffs of Scituate which may prove to be of pre-Pleistocene origin. Mr. H. E. Simpson, in collaboration with Mr. G. F. Low, finished a topographic model of Crook Mountain, a laccolithic dome in the Black Hills.

Professor Jaggar continued his experimental studies of erosion, for which purpose a pneumatic spraying apparatus was installed in the basement of the Museum. He made a new model of the sclerometer, an instrument for testing the hardness of minerals, and also constructed a telemeter-alidade designed for reconnaissance mapping. Experiments with these instruments are in progress.

Mr. François E. Matthes, U. S. G. S., gave a course (Geology 13) in topographic work for the instruction of students in geological surveying.

The subcommittees of the Department present the accompanying reports.

The Committee on The Gardner Collection of Photographs (Professors Ward, Woodworth, and Dr. P. S. Smith) reports as follows:—

| State of the Gardner Collection, June 27, 1904. | Photographs. | Slides. | Negatives. |
|---|--------------|---------|------------|
| Accessions since last report | 87 | 103 | 127 |
| Unidentified views | 253 | 30 | 0 |
| Duplicates | 144 | 51 | 0 |
| Broken | | 1 | 0 |
| Last accession number, June 14 . . | 5654 | 4308 | 0 |
| Number now in collection | 5582 | 4623 | 1236 |

The accessions for the year include slides and photographs from the British Association for the Advancement of Science, gifts to the University from Messrs. Du Bois, F. E. Matthes, Robert W. Sayles, W. M. Davis, J. B. Woodworth; also 26 views from Professor Shaler which have not yet been placed in the collection. During the year Mr. Turpin has spent considerable time in repairing and rebuilding the slides. He was also employed in making a number of negatives from original materials.

The subcommittee on the Geological Museum (Professors R. T. Jackson, Jaggar, Wolff, and Woodworth) report that in November, 1904, the Corporation granted to the Geological Department \$1160.12, the balance of the building fund of the Geological Museum, to be expended for cases in the exhibition rooms. With this money and by making use in part of old cases given last year by the Museum of Comparative Zoölogy, six exhibition cases have been built in the southwest exhibition room. They are, one long wall case on the east wall; three cases between windows on the west wall, and two large centre cases with table and upright central portion and space beneath for storage in trays. These cases when filled with exhibition material will make an excellent nucleus for the Geological Museum.

A subcommittee appointed to make nominations for the Josiah Dwight Whitney Scholarship (Professors Davis, Jaggar, and Woodworth) recommended that two scholarships of \$100.00 each be awarded to Messrs. S. A. Starratt and W. F. Low, students in the course given in the Rocky Mountains of Montana by Professor Woodworth.

The following is a list of Publications which have appeared since the last report: —

By N. S. SHALER.

A Comparison of the Features of the Earth and the Moon. Smithsonian Contributions to Knowledge, Vol. 34, No. 1438, pp. 1-130, pls. 1-25. 1903.

By R. DE C. WARD.

Notes and Reviews in Science, Bulletin of the American Geographical Society, and The Journal of Geography.

By J. B. WOODWORTH.

Administrative report of work done in New York. Embodied in report of the State Geologist, Dr. F. J. H. Merrill, for 1902. 56th Annual Report of the N. Y. State Museum, Albany, N. Y., pp. r8-r10. 1904.

Pleistocene geology of Mooers Quadrangle, being a portion of Clinton Co., N. Y. Bull. 83 (Geology 7), N. Y. State Museum, pp. 3-57, with colored geological map and pls. 1-25. 1905.

Ancient water-levels of the Champlain and Hudson Valleys. Bull. 84 (Geology 8), N. Y. State Museum, pp. 65-259, pls. 1-29, 24 figures in text. 1905.

The Brandon Clays. Report of the Vermont State Geologist, 1903-1904, pp. 166-168. 1904. [2 lines only at top of p. 168; the matter following appears to have been supplied by Professor Perkins.]

[A reprint of] Penning's Dip, Depth, and Thickness Table. Published by the University. 1 p. 1904.

Reviews of geological books in The Nation, Amer. Journ. Sci., and Amer. Nat.

By T. A. JAGGAR, JR.

Economic Resources of the Northern Black Hills. Part I. General Geology [and geologic maps]. Professional Paper No. 26, U. S. Geological Survey, pp. 1-41. 1904.

REPORT ON THE MAMMALS.

BY OUTRAM BANGS.

ABOUT two hundred and fifty specimens have been added by gift, exchange, or purchase, to the collections of Mammals during the year. The larger part of these are from two sources, the John E. Thayer Expedition to northern South America, presented by Mr. Thayer, and the series of bats collected in the Bahamas by Messrs. G. M. Allen, Thomas Barbour, and Owen Bryant, and by them given to the Museum. The Department is also indebted to Capt. Wirt Robinson and to Messrs. Thomas Barbour and Allan C. Brooks for acceptable specimens; personally, I have added a few. Specimens have been sent to Drs. J. A. Allen and Oldfield Thomas for examination.

I have published during the year:—

In the Bulletin of the Museum of Comparative Zoölogy:—

The Vertebrata of Gorgona Island, Colombia (Introduction, Mammalia, and, in joint authorship with John E. Thayer, Aves). Vol. 46, No. 5, pp. 87-102. June, 1905.

In the American Naturalist:—

Birds of the Isle of Pines (with W. R. Zappey). Vol. 39, pp. 179-215. April, 1905.

In the Auk:—

The Cuban Crab Hawk, *Urubitinga gundlachii* (Cabanis). Vol. 22, pp. 307-309. July, 1905.

In the Proceedings of the Biological Society of Washington:—

A Correction of Barrows' Record of *Coccyzus pumilus* from Concepcion del Uruguay. Vol. 17, pp. 165-166. Dec. 27, 1904.

On a Supposed Continental Specimen of *Solenodon*. Vol. 17, pp. 166-167. Dec. 27, 1904.

Descriptions of Seven New Subspecies of American Birds. Vol. 18, pp. 151-156. June 9, 1905.

What is *Icterus gualanensis* Underwood? Vol. 18, pp. 167-170. June 29, 1905.

The Name of the Panama Green Honey Creeper. Vol. 18, p. 186. June 29, 1905.

In the Proceedings of the New England Zoölogical Club: —

Notes on the Deer Mice (*Peromyscus*) of some of the Islands off the Southern New England Coast. Vol. 4, pp. 11-15. Feb. 28, 1905.

REPORT ON THE BIRDS.

BY WILLIAM BREWSTER.

DURING the past year the following birds have been purchased for the Museum: from Mr. J. S. Warmbath, thirty-two skins of water-birds, (Alcidae and Laridae) taken in Ellesmere Land and Greenland; from Mr. Rowland Ward, a South African Ostrich (*Struthio australis*, male); from Mr. H. W. Henshaw, a pair of Palilas (*Loxioides bailleui*) from Hawaii.

By exchange we have obtained from the West Australian Museum twenty-three skins representing nineteen species of Australian birds, and from Mr. Outram Bangs a specimen of the rare, and perhaps already extinct, St. Vincent Parrot (*Amazona guildingi*).

The Museum has acquired by gift: from Colonel John E. Thayer, a Parrot (*Calopsittacus novae-hollandiae*, male) from Australia, and five hundred and sixty-six skins of Central American birds, representing over one hundred different species, collected on Gorgona Island, on the Pearl Islands, and at Panama, by Mr. Wilmot W. Brown; from Messrs. G. M. Allen, Thomas Barbour, and Owen Bryant, ninety-nine skins representing thirty-seven species, with a few nests and eggs, collected in the Bahamas; from Mr. Thomas Barbour the skin of a New Guinea Green Parrot (*Electus pectoralis*, male) taken in New Guinea, and a partial albino House Sparrow (*Passer domesticus*) from Massachusetts; from Mr. Walter Faxon, the skin of a Black-billed Cuckoo (*Coccyzus erythrophthalmus*, female) obtained in Massachusetts; from Mr. Robert Rogers, a Flicker (*Colaptes auratus luteus*) taken in Massachusetts; from Mrs. J. W. Elliot, a skin of a Tree Duck (*Dendrocygna eytoni*) from Queensland.

A small series of North American birds' eggs has also been received from some source at present unknown to the authorities of the Museum.

A rearrangement of our general collection of labelled and catalogued bird skins in accordance with the system followed in Dr.

Sharpe's Hand List has been begun. As the birds are assembled in the new order they are placed in new cases of large size and improved pattern, where they will be more easily accessible than they have been heretofore. The families thus far dealt with extend from Struthionidae to Stercorariidae.

In the Report for 1899-1900 (p. 29), and again in that for 1902-1903 (p. 23) I mentioned the receipt by the Museum, from the Bryant-Bigelow families of Boston, of a large number of skins, chiefly of North American and West Indian birds. These were at first placed in the Museum on deposit, but they have since come into our possession as an unconditional gift. Within the past few months I have reviewed most of them for cataloguing and relabelling. While working on them I have become more and more deeply impressed with the value and importance of the collection. It contains a number of exceptionally rare specimens, among which are a European Teal shot on Currituck Sound, a hybrid between the Mallard and Wigeon, a Carolina Paroquet, taken April 24, at Bald Island, Nebraska — where the species has long since ceased to occur, and several Passenger Pigeons — now almost if not quite extinct. Especially interesting to ornithologists of the present day are the birds which formed the original nucleus of the collection and which were obtained by Dr. Henry Bryant, forty or more years ago, chiefly in the Bahamas, in Florida, and at various localities in New England (especially near Boston) and in the Middle States. There are also very many skins, bearing his original, clearly-inscribed, manuscript labels, which he must have secured by purchase or exchange, and which came from parts of North America at that day remote and seldom visited by collectors, such as the region about Hudson Bay, the Rocky Mountains, and the northwest coast. Among these northern and western birds, then but imperfectly known, as well as among the species which Dr. Bryant himself obtained along or near the Atlantic seaboard, I have yet to find a single specimen which was incorrectly named by him. What other ornithologist of his time — excepting possibly Professor Baird — has left so remarkable a record!

Dr. Bryant's reputation for exceptional ability and acumen as an ornithologist has been too long established, of course, to require confirmation from evidence such as that just mentioned. It is perhaps not equally well known, however, that he was one of the very first — if not actually *the* first — of American orni-

thologists to collect bird skins in large series, and that he had rare skill in preparing them. Not only was his handiwork distinctly superior to that of any other of his contemporaries—including even the professionals—but it scarcely suffers by comparison with the best work of the present day. Moreover it reveals the interesting fact that he knew and practised, if he did not originate, as far back as 1860, certain methods of taxidermy which are popularly supposed to have been discovered within the past twenty-five or thirty years.

I have published during the year : —

In *Country Life in America*, Vol. 7, No. 6, pp. 688, 690 : —

Mr. Brunner's Grouse Pictures.

In the *Condor*, Vol. 7, pp. 95-96 : —

The Future Problems and Aims of Ornithology. A letter.

REPORT ON THE REPTILES, BATRACHIANS,
AND FISHES.

BY SAMUEL GARMAN.

ADDITIONAL material for these Departments, in the year ending July 31, 1905, has been provided by purchases from Capt. Alan Owston and Mr. B. Grover, and by donations from Dr. Alex. Agassiz, Sergeant Breivogel, Messrs. John E. Thayer, Outram Bangs, Thomas Barbour, W. T. Hornaday, R. L. Ditmars, Owen Bryant, Eugene N. Fischer, W. C. Kendall, R. H. Howe, Jr., B. G. Wilder, the New York Zoölogical Society, and the United States Fish Commission. The collection of Fishes and Reptiles sent in by Mr. Thayer, the Fishes purchased from Captain Owston, and the series of Ophidia bought from Mr. Grover were of especial importance. A few of the Reptiles have been mounted for exhibition. Shipments in exchange were made to Drs. F. A. Lucas and W. C. Kendall. A considerable use of the collections has been made by students in preparation of articles for publication. The condition of the specimens has not greatly changed; there has been the usual amount of bleaching and discoloration in those exposed to the light, comparatively little breakage, and a small amount of leakage from some of the older cans. The routine work, identification, cataloguing, preservation, and correspondence, has not differed greatly from that of previous years. The work on the Plagiostomes has progressed without cessation.

REPORT ON THE ENTOMOLOGICAL DEPARTMENT.

THE most important accession to the Entomological Department is the collection of the late Dr. A. S. Packard of Brown University. Dr. Packard left the disposition of his collections to his son, Mr. A. A. Packard, who gives the entomological material without restriction to the Museum. It consists of insects, dry, alcoholic, and microscopic, and represents Dr. Packard's entomological work from 1878 till his death. The collection will require careful, critical study, but is of especial importance to the Museum and to science, as the insects accumulated by Dr. Packard during his connection with the Peabody Academy of Science at Salem, are a part of the collection of the Museum (see Report, 1885-86, pp. 22-23). For additional gifts the Department is indebted to Messrs. G. M. Allen, Thomas Barbour, F. E. Blaisdell, J. H. Blake, F. C. Bowditch, Henry Brooks, Owen Bryant, Walter Deane, George Dimmock, J. H. Emerton, I. A. Field, Charles Fuchs, J. G. Jack, C. W. Johnson, Frederick Knab, E. L. Mark, A. P. Morse, J. G. Needham, A. R. Perry, Alexander Petrunkévitch, F. W. Putnam, Wirt Robinson, J. D. Sherman, F. A. Sherriff, A. H. Thayer, E. C. Van Dyke, and E. B. Williamson. A valuable series of Syntomidae from the vicinity of Corocito, Venezuela, a number of Coleoptera from Java, and a small set of Nova Scotian insects should also be noted among the accessions of the year.

A revisional rearrangement of the Heliconidae, Acraeidae, and a part of the Noctuidae of the Lepidoptera and of the Gomphidae of the Odonata has been completed; some of the fossil insects have been arranged and labelled and the entire collection of microscopic slides has been arranged.

REPORT ON THE CRUSTACEA AND MOLLUSCA.

BY WALTER FAXON.

By exchange with the Imperial Academy of Sciences of St. Petersburg, a very valuable collection of Crayfishes has been obtained, a collection comprising all the species found in the river basins of Russia, Transcaucasia, Turkestan, Manchuria, and Korea. Mr. A. A. Packard has given to the Museum the microscopic sections of *Limulus* eggs and Crustacea which served as the basis for several of the published memoirs of the late Dr. Packard. From Alex. E. Wight a small collection of the land Crustacea of the Bahamas has been purchased. The Museum owes thanks to Dr. R. T. Jackson for the gift of *Estherias* from DeWitt, Neb., to Messrs. G. M. Allen, Th. Barbour, and O. Bryant for Crustacea dredged off Abaco, Bahamas, in 3-15 fathoms, to Messrs. S. Henshaw and A. Gulick for additions to the Department of Mollusca.

The *Macrura* of the "Blake" Expedition provisionally reported upon by the late Alphonse Milne Edwards (*Bull. M. C. Z.*, Vol. VIII. No. 1, 1880; *Ann. Sci. Nat.*, 1881) have again been sent to Paris to be further elaborated by Milne Edwards's collaborator, M. E. L. Bouvier.

Dr. Harriet Richardson of Washington has critically revised our whole collection of North American Isopoda, now safely returned and catalogued.

REPORT ON THE DEPARTMENT OF VERTEBRATE PALAEONTOLOGY.

BY CHARLES R. EASTMAN.

A SMALL quantity of fish remains from the Horton series in Kings County, Nova Scotia, was collected by the assistant during the summer vacation — sufficient, however, to confirm the conclusion already reached by palaeobotanists that these strata are of Lower Carboniferous age, instead of Devonian, as at one time supposed. From Dr. L. C. Jones, of Malden, Mass., a series of *Zeuglodon* vertebrae from the phosphate beds of Charleston, South Carolina, was received in October, and some good specimens of Green River Fishes from Wyoming were presented by Mr. Thomas Barbour in December. A few Cretaceous Sharks' teeth, from an artesian well boring near Doland, S. D., were given by Professor J. E. Todd, of Vermilion, S. D., in May, and various deep-sea Cetacean bones and teeth of *Lamnidae* were received from the "Albatross" Expedition of 1904-05 in June. Amongst the latter, a single tooth of *Carcharodon* is remarkable for having the entire substance of the dentine preserved, although the amount of mineral impregnation does not indicate recent burial.

Three cases have been filled with specimens to illustrate the Vertebrates in the Palaeozoic exhibition room, and others have been selected for the Mesozoic room. A new floor was laid during the fall in one of the rooms of the storage series, and other improvements made. Since the first of January, the assistant has been principally engaged in the preparation of a memoir on Devonian fishes.

The following publications were issued during the year: —

Asterolepid Appendages. *Amer. Journ. Sci.*, (4) Vol. 18, pp. 141-144. 1904.

Fossil Plumage. *Amer. Nat.*, Vol. 38, pp. 669-672. 1904.

Palaeontology. *Ibid.*, pp. 677-679. 1904.

A Second Century Criticism of Virgil's Etna. Pop. Sci. Monthly, Vol. 65, pp. 452-456. 1904.

On Upper Devonian Fish Remains from Colorado. Amer. Journ. Sci., (4) Vol. 18, pp. 253-260. 1904.

[Miocene] Pisces. Maryland Geol. Surv. Miocene, pp. 71-93, pls. 28-32. 1904.

A Brief General Account of Fossil Fishes. Ann. Rept. State Geol. N. J. for 1904, pp. 29-66. 1905.

The Triassic Fishes of New Jersey. *Ibid.*, pp. 67-130, pls. 1-14. 1905.

Les Types de poissons fossiles du Monte-Bolca au Muséum d'Histoire Naturelle de Paris. Mém. Soc. Géol. France, Vol. 13, Mémoire No. 34, pp. 34. pls. 1-5. 1905.

Anaximandre, le premier des précurseurs de Darwin. Revue Scient., (5) Vol. 3, pp. 769-772. 1905.

The Literature of Edestus. Amer. Nat., Vol. 39, pp. 405-409. 1905.

Also various reviews and short articles in the American Naturalist and Science.

REPORT ON THE LIBRARY

DURING the year from August 1, 1904, to July 31, 1905, inclusive, 1,093 volumes, 1,914 parts of volumes, and 1,703 pamphlets have been added to the Library.

The total number of volumes in the Library is 41,157, the total number of pamphlets is 35,033.

One thousand two hundred and eighty-six volumes have been bound ; eight hundred pamphlets have been separately bound.

[A]

PUBLICATIONS

OF THE

MUSEUM OF COMPARATIVE ZOOLOGY

FOR THE YEAR 1904-1905.

Bulletin:—

Vol. XLII.

- No. 6. The Sand Plains of Glacial Lake Sudbury. By JAMES WALTER GOLDTHWAIT. pp. 41. 5 Plates. May, 1905.

Vol. XLIII.

- No. 2. Reports on the Dredging Operations off the West Coast of Central America to the Galapagos, to the West Coast of Mexico, and in the Gulf of California, in charge of Alexander Agassiz, carried on by the U. S. Fish Commission Steamer "Albatross," during 1891, Lieut. Commander Z. L. Tanner, U. S. N., Commanding. XXXIII. Stein- und Hydro-Korallen. Von EMIL VON MARENZELLER. pp. 16. 3 Plates. August, 1904.
- No. 3. Reports on the Dredging Operations off the West Coast of Central America to the Galapagos, to the West Coast of Mexico, and in the Gulf of California, in Charge of Alexander Agassiz, carried on by the U. S. Fish Commission Steamer "Albatross," during 1891, Lieut. Commander Z. L. Tanner, U. S. N., Commanding. XXXIV. Lagisca irritans, sp. nov., ein Symbiont von Hydrokorallen. Von EMIL VON MARENZELLER. pp. 6. 1 Plate. August, 1904.

Vol. XLV.

- No. 4. Contributions from the Zoölogical Laboratory. No. 157. The Maturation, Fertilization, and Early Cleavage of Haminea solitaria (Say). By W. M. SMALLWOOD. pp. 60. 13 Plates. December, 1904.

Vol. XLVI.

- No. 2. Maldive Cephalochordates, with the Description of a New Species from Florida. By G. H. PARKER. pp. 16. 2 Plates. November, 1904.
- No. 3. Batrachia and Reptilia from the Bahamas. By THOMAS BARBOUR. pp. 10. December, 1904.
- No. 4. Three Letters from Alexander Agassiz to the Hon. George M. Bowers, United States Fish Commissioner, on the Cruise, in the Eastern Pacific, of the U. S. Fish Commission Steamer "Albatross," Lieut. Commander L. M. Garrett, U. S. N., Commanding. pp. 22. April, 1905.
- No. 5. The Vertebrata of Gorgona Island, Colombia. By OUTRAM BANGS, THOMAS BARBOUR, WILMOT W. BROWN, JR., and JOHN E. THAYER. pp. 18. June, 1905.

No. 6. Reports on the Scientific Results of the Expedition to the Eastern Tropical Pacific, in Charge of Alexander Agassiz, by the U. S. Fish Commission Steamer "Albatross," from October, 1904, to March, 1905, Lieut. Commander L. M. Garrett, U. S. N., Commanding. II. Description of a New Genus of Isopods, Typical of a Peculiar Family. By HARRIET RICHARDSON. pp. 4. 1 Plate. July, 1905.

Vol. XLVII.

Nemerteans of the West and Northwest Coasts of America. By WESLEY R. COE. pp. 318. 25 Plates. March, 1905.

Memoirs :—

Vol. XXV.

No. 2. Cleiocrinus. By FRANK SPRINGER. pp. 24. 1 Plate. January, 1905.

Vol. XXXI.

Reports on an Exploration off the West Coasts of Mexico, Central and South America, and off the Galapagos Islands, in Charge of Alexander Agassiz, by the U. S. Fish Commission Steamer "Albatross," during 1891, Lieut. Commander Z. L. Tanner, U. S. N., Commanding. XXXII. The Panamic Deep Sea Echini. By ALEXANDER AGASSIZ. 10, 243 pp. 112 Plates. November, 1904.

Vol. XXXII.

Reports on an Exploration off the West Coasts of Mexico, Central and South America, and off the Galapagos Islands, in Charge of Alexander Agassiz, by the U. S. Fish Commission Steamer "Albatross," during 1891, Lieut. Commander Z. L. Tanner, U. S. N., Commanding. XXXV. Reports on the Scientific Results of the Expedition to the Tropical Pacific, in Charge of Alexander Agassiz, on the U. S. Fish Commission Steamer "Albatross," from August, 1899, to March, 1900, Commander Jefferson F. Moser, U. S. N., Commanding. VII. Asteroidea. By HUBERT LUDWIG. 12, 292 pp. 36 Plates. July, 1905.

Report :—

1903-1904. pp. 35. December, 1905.

[B]

INVESTED FUNDS OF THE MUSEUM.

IN THE HANDS OF THE TREASURER OF HARVARD COLLEGE, SEPT. 1, 1905.

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| Sturgis-Hooper Fund | \$108,720.83 |
| Gray Fund | 50,000.00 |
| Agassiz Memorial Fund | 297,933.10 |
| Teachers and Pupils Fund | 7,594.01 |
| Permanent Fund | 117,469.34 |
| Humboldt Fund | 7,740.66 |
| Virginia Barret Gibbs Fund | 5,554.58 |
| Willard Peele Hunnewell Memorial Fund | 5,000.00 |
| | <hr/> |
| | \$600,012.52 |

The payments on account of the Museum are made by the Bursar of Harvard College, on vouchers approved by the Curator. The accounts are annually examined by a committee of the Overseers. The only funds the income of which is restricted, the Gray and the Humboldt Funds, are annually charged in an analysis of the accounts, with vouchers to the payment of which the income is applicable.

The income of the Gray Fund can be applied to the purchase and maintenance of collections, but not for salaries.

The income of the Virginia Barret Gibbs Scholarship Fund, of the value of \$250, is assigned annually with the approval of the Faculty of the Museum, on the recommendation of the Professors of Zoölogy and of Comparative Anatomy in Harvard University, "in supporting or assisting to support one or more students who may have shown decided talents in Zoölogy, and preferably in the direction of Marine Zoölogy."

The income of the Humboldt Fund (about \$300) can be applied for the benefit of one or more students of Natural History, either at the Museum, the United States Fish Commission Station at Wood's Hole, Bermuda, or the Tortugas.

Applications for the tables reserved for advanced students at the Wood's Hole Station should be made to the Faculty of the Museum before the 1st of May. Applicants should state their qualifications, and indicate the course of study they intend to pursue.

The following Publications of the Museum of Comparative Zoölogy
are in preparation:—

Reports on the Results of Dredging Operations in 1877, 1878, 1879, and 1880, in charge of ALEX-
ANDER AGASSIZ, by the U. S. Coast Survey Steamer "Blake," as follows:—

- H. AUGENER. The Annelids of the "Blake."
C. HARTLAUB. The Comatulæ of the "Blake," with 15 Plates.
H. LUDWIG. The Genus *Pentacrinus*.
A. MILNE EDWARDS and E. L. BOUVIER. The Crustacea of the "Blake."
A. E. VERRILL. The Alcyonaria of the "Blake."

Reports on the Scientific Results of the Expedition to the Tropical Pacific, in charge of
ALEXANDER AGASSIZ, on the U. S. Fish Commission Steamer "Albatross," from August,
1899, to March, 1900, Commander Jefferson F. Moser, U. S. N., Commanding.

- LOUIS CABOT. Immature State of the Odonata, Part IV.
E. L. MARK. Studies on *Lepidosteus*, continued.
" On *Arachnactis*.
R. T. HILL. On the Geology of the Windward Islands.
W. McM. WOODWORTH. On the Bololo or Palolo of Fiji and Samoa.
AGASSIZ and WHITMAN. Pelagic Fishes. Part II., with 14 Plates.

Reports on the Results of the Expedition of 1891 of the U. S. Fish Commission Steamer
"Albatross," Lieutenant Commander Z. L. TANNER, U. S. N., Commanding, in charge of
ALEXANDER AGASSIZ, as follows:—

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|---|---|
| A. AGASSIZ. The Pelagic Fauna. | S. J. HICKSON. The Antipathids. |
| " The Panamic Deep-Sea Fauna. | J. P. McMURRICH. The Actinarians. |
| H. B. BIGELOW. The Siphonophores. | E. L. MARK. Branchiocerianthus. |
| K. BRANDT. The Sagittæ. | JOHN MURRAY. The Bottom Specimens. |
| " The Thalassicolæ. | P. SCHIEMENZ. The Pteropods and Hete- ropods. |
| W. R. COE. The Nemerteans. | THEO. STUDER. The Alcyonarians. |
| W. H. DALL. The Mollusks. | M. P. A. TRAUSTEDT. The Salpidae and Doliolidae. |
| REINHARD DOHRN. The Eyes of Deep- Sea Crustacea. | H. B. WARD. The Sipunculids. |
| H. J. HANSEN. The Cirripeds. | W. McM. WOODWORTH. The Annelids. |
| HAROLD HEATH. Solenogaster. | |
| W. A. HERDMAN. The Ascidians. | |

PUBLICATIONS
OF THE
MUSEUM OF COMPARATIVE ZOÖLOGY
AT HARVARD COLLEGE.

There have been published of the BULLETIN Vols. I. to XLII., and also Vols. XLIV., XLV., and XLVII.; of the MEMOIRS, Vols. I. to XXIV., and also Vols. XXVIII., XXIX., XXXI., and XXXII.

Vols. XLIII., XLVI., XLVIII., XLIX., and L. of the BULLETIN, and Vols. XXV., XXVI., XXVII., XXX., XXXIII., XXXIV., and XXXV. of the MEMOIRS, are now in course of publication.

The BULLETIN and MEMOIRS are devoted to the publication of original work by the Professors and Assistants of the Museum, of investigations carried on by students and others in the different Laboratories of Natural History, and of work by specialists based upon the Museum Collections and Explorations.

The following publications are in preparation:—

Reports on the Results of Dredging Operations from 1877 to 1880, in charge of Alexander Agassiz, by the U. S. Coast Survey Steamer "Blake," Lieut. Commander C. D. Sigsbee, U. S. N., and Commander J. R. Bartlett, U. S. N., Commanding.

Reports on the Results of the Expedition of 1891 of the U. S. Fish Commission Steamer "Albatross," Lieut. Commander Z. L. Tanner, U. S. N., Commanding, in charge of Alexander Agassiz.

Reports on the Scientific Results of the Expedition to the Tropical Pacific, in charge of Alexander Agassiz, on the U. S. Fish Commission Steamer "Albatross," from August, 1899, to March, 1900, Commander Jefferson F. Moser, U. S. N., Commanding.

Reports on the Scientific Results of the Expedition to the Eastern Pacific, in charge of Alexander Agassiz, on the U. S. Fish Commission Steamer "Albatross," from October, 1904, to April, 1905, Lieut. Commander L. M. Garrett, U. S. N., Commanding.

Contributions from the Zoölogical Laboratory, Professor E. L. Mark, Director.

Contributions from the Geological Laboratory, in charge of Professor N. S. Shaler.

These publications are issued in numbers at irregular intervals; one volume of the Bulletin (8vo) and half a volume of the Memoirs (4to) usually appear annually. Each number of the Bulletin and of the Memoirs is sold separately. A price list of the publications of the Museum will be sent on application to the Librarian of the Museum of Comparative Zoölogy, Cambridge, Mass.

